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$a^3=v^6$, $b^3=8v^6$ and $c^3=27v^6$. Forming the equation from the roots, we have: $x^3-(a^3+b^3+c^3)x^2+(a^3b^3+a^3c^3+b^3c^3)x-a^3b^3c^3=0$.

Substituting values of a, b, c and reducing, we have:

$x^3-36v^6x^2+251v^{12}x-216v^{18}=0$, where "$v$" may be 1, 2, 3, etc., in succession.

II. Solution by A. H. HOLMES, Brunswick, Maine, and G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics in Texarkana College, Texarkana, Arkansas-Texas.

Let a, b, c be the roots of the cubic equation.

$\therefore x^3-(a+b+c)x^2+(ab+ac+bc)x=abc$, is the equation.

Let $a=5m^2$, $b=3m^2$, $c=m^2$. $\therefore 5m^2+3m^2+m=9m^2$.

$\therefore x^3-9m^2x^2+23m^4x=15m^6$ ....(1).

Let $a=m^2+mn$, $b=n^2-mn$, $c=2mn$, $m>n$.

$\therefore m^2+mn+n^2-mn+2mn=(m+n)^2$.

$\therefore x^3-(m+n)^2x^2+(3m^3n+3mn^3)x=2m^4n^2-2m^2n^4$ ....(2).

(1) and (2) both satisfy the conditions.

41. Proposed by H. C. WILKES, Skull Run, West Virginia.

Given $\dfrac{50(a+b)}{ab}=\dfrac{81(c+d)}{cd}$......(1); $\dfrac{56(a+c)}{ac}=\dfrac{75(b+d)}{bd}$......(2);

$\dfrac{65(b+c)}{bc}=\dfrac{66(a+d)}{ad}$......(3), to find the least integral values of a, b, c, d.

I. Solution by the PROPOSER.

The sum of equations (1), (2) and (3), after clearing of fractions, can be reduced to $20d(ab+ac+bc)=111abc$......(4).

Eliminating from (1) and (4), $6d=9c$.

Eliminating from (2) and (4), $5d=9b$.

Eliminating from (3) and (4), $4d=9a$.

$\therefore$ The numbers are in the ratio $a4$, $b5$, $c6$, $d9$, which will be the least integers that will satisfy the equation. [See problem No. 36.]

II. Solution by A. H. BELL, Hillsboro, Illinois.

Arranging, $50acd+50bcd=81abc+81abd$. (1).
$75acd+56bcd=-75abc+56abd$. (2).
$65acd-66bcd=66abc-65abd$. (3).
(1)×3 $150acd+150bcd=243abc+243abd$. (4).
(2)×2 $150acd-112bcd=-150abc+112abd$. (5).
(4)−(5) $262bcd=393abc+131abd$. (6).
(2)×13 $975acd-728bcd=-975abc+728abd$. (7).
(3)×15 $975acd-990bcd=990abc-975abd$. (8).
(7)−(8) $262bcd=-1965abc+1703abd$.(9).
(9)−(6), and reducing $3c=2d$. $\therefore c=2$, and $d=3$ (10).
These values in (1) and (2), etc., $a=4$ and $b=5$ (11).

To obtain the relative values between the two sets of values (10) and (11), take $(6)\times 1703-(9)\times 131$, results in $9a=4d$. $\therefore$ $a=4$ and $d=9$, $b=5$ and $c=6$. These are prime to each other. $\therefore$ are the least values.

III. Solution by COOPER D. SCHMITT, M. A., Professor of Mathematics, University of Tennessee, Nashville, Tennessee.

The equations can be written: $50\left(\frac{1}{a}+\frac{1}{b}\right)=81\left(\frac{1}{c}+\frac{1}{d}\right)$,

$56\left(\frac{1}{c}+\frac{1}{a}\right)=75\left(\frac{1}{b}+\frac{1}{d}\right)$, $65\left(\frac{1}{b}+\frac{1}{c}\right)=66\left(\frac{1}{a}+\frac{1}{d}\right)$.

Let $1/a=x$, $1/b=y$, $1/c=z$, and $1/d=u$, and the equations become $50x+50y-81z-81u=0$; $56x-75y+56z-75u=0$; $66x-65y-65z+66u=0$.

Thus we have three equations with four unknown quantities.

By determinants $x:y:z:u::$

$$\begin{vmatrix} 50, & -81, & -81 \\ -75, & 56, & -75 \\ -65, & -65, & 66 \end{vmatrix} : - \begin{vmatrix} 50, & -81, & -81 \\ 56, & 56, & -75 \\ 66, & -65, & 66 \end{vmatrix} : \begin{vmatrix} 50, & 50, & -81 \\ 56, & -75, & -75 \\ 66, & -65, & 66 \end{vmatrix} : - \begin{vmatrix} 50, & 50, & -81 \\ 56, & -75, & 56 \\ 66, & -65, & -65 \end{vmatrix}$$

Evaluating the determinants, we have,

$x:y:z:u::(131)^2 90:(131)^2 72:(131)^2 60:(131)^2 40$,

or $x:y:z:u::90:72:60:40$.

Hence $1/a:1/b:1/c:1/d::90:72:60:40$,

or $a:b::c:d::4:5:6:9$;

whence $a=4$, $b=5$, $c=6$, $d=9$ are the lowest values.

Also solved by *A. H. HOLMES*.

PROBLEMS.

47. Proposed by EDMUND FISH, Hillsboro Illinois.

A rectangular field, whose length and breadth in rods are in whole numders, is enclosed with a fence and subdivided by fences on both diagonals, the total length of the fences is 2204 rods; required the sides and area.

48. Proposed by SYLVESTER ROBBINS, North Branch Depot, New Jersey.

The edges of a rectangular parallelopiped are within 1 of the proportion $2:3:9$, and they are $2x\pm1$, $3x$ and $9x$, $(2x\mp1)^2+(3x)^2+(9x)^2=$the diagonal squared$=94x^2\mp4x+1=\square$. To find four integral values for x.